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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
OWENS, GARRISON A	

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1639	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/522,161	TELLIER ET AL.	
	Examiner	Art Unit	
	Garrison Owens	1639	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED. (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 March 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-19* is/are pending in the application.

4a) Of the above claim(s) *3,5-6,17, 18* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-19* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *24 January 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *24 January 2005*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Detailed Action

Status of Claims

1. Claims 1-19 are pending in this application. Claims 13-15, 17-18 are withdrawn from consideration. Claims 13-15, 17-18 withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected group, there being no allowable generic or linking claim.

Election Restriction

2. Applicants' election of Group I, claims 1-12, 16 and 19, with traverse in the reply filed 7 March 2007, is acknowledged. Applicants' election of the following species is acknowledged.

In claims 1 and 2, applicants elect the species biopolymer as a nucleic acid phosphorylated in the 5' position and a nucleic acid phosphorylated in the 3' position. However, this election is non-compliant with the election of species requirement because applicant elected a phosphorylated nucleic acid. Applicant is required to elect one species of biopolymer selected from the group consisting of a nucleic acid phosphorylated in the 5'position, a nucleic acid phosphorylated in the 3' position, a phosphorylated protein, and a phosphorylated polysaccharide.

In claim 4, the applicants elect the species of poly G spacer.

During a telephone conversation with Robert Madsen, attorney of record on 26 July 2007 an election of species was made with traverse. The applicants elected the species of nucleic acid phosphorylated in the 5' position as defined by claim 2. Affirmation of this election must be made by applicant in replying to this Office action. Claims 17-18 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

For Groups I and II, the Examiner agrees with the applicants' argument that Belleza et al, do not support the preliminary determination of lack of unity. The applicants' arguments regarding the restriction requirement between Groups I and II are found to be persuasive. Therefore, the restriction requirement between groups I and II is withdrawn. However, the Examiner is not persuaded by the applicants' arguments for the use of the kit in claim 16. The Examiner contends that a kit for use in a micro-array experiment exists (see US Patent 7,097,974 B1), and one of ordinary skill in the art would have understood that a kit is a common component of a microarray experiment; and therefore, the "special technical feature" is not a contribution over the prior art. The restriction is deemed proper and made final.

Claims 3, 5-6, are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected species and inventions.

Claims 1-2, 4, 7-16, and 19 are examined.

Claim Rejections – 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims **1 and 13** and by dependency, claims **2-12 and 14-16** are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

3. For claims 1 and 13, the biopolymer carrying a **free** phosphate group being immobilized on said surface by ionocovalent **bonding** between the **free** phosphate group of the polymer and the metal. The Examiner is unclear how the phosphate group of the nucleic acid can be **free and bound** to a metal. Therefore claims 1, 13 and all dependent claims are rejected.

Claim Rejections – 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claim 16 is rejected under 35 USC 102(e) as being unpatentable over Stahler et al, (US Patent 7,097,974).

4. For **claim 16**, a Kit for the preparation of a biochip, comprising the following elements: a solid support having a surface covered with a metal capable of coordination bonding with a phosphate group; at least one biopolymer carrying a phosphate group; optionally reagents.

Stahler et al, teach (see abstract, column 4, lines 44-48; column 5, line 26; column 8, lines 14-15) a solid support having a surface covered in a metal with a nucleic acid bound to it. Stahler et al, teach (see column 4, lines 44-48) reagents for carrying out the microarray experiments are included in the kit.

Claim Rejections – 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of

the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. **Claims 1, 4, 7-15** are rejected under 35 U.S.C. 103(a) as being unpatentable over Agrawal et al, (WO 2003/046508 A2) in view of Petruska, et al, (Thin Solid Films, 327-329 (1998) 131-135, Elsevier Science) and Lockhart et al, (US Patent 5,556,752)

For **claims 1, 4, 7-15**, a biochip, comprising a flat solid support having a surface covered with a metal and capable of coordination bonding with a phosphate at least one biopolymer carrying a free phosphate group being immobilized on said surface by ionocovalent bonding between the free phosphate group of the polymer and the metal.

Agrawal et al teach (see paragraph 25) a biomolecule, which can be a nucleic acid, immobilized to a glass solid support substrate (see paragraphs 20 and 80). The biomolecule is covalently/coordinately attached to the substrate (see paragraphs 131 and 132). The solid support can be coated with an organic or inorganic activating material such as zirconia (see paragraphs 42, 144). The activating material is used to help immobilize the biomolecule to the solid support.

The prior art teachings of Agrawal et al differ from the claimed invention as follows:

Agrawal; et al, fail to teach the following:

Agrawal et al, fail to teach a metal, zirconium, is bound to the surface of the solid support by a spacer molecule, octadecylphosphonic acid. Agrawal et al, also fail to teach specifically a zirconium bonding with a phosphate group.

However, the teachings of Petruska, et al, remedies the deficiencies of Agrawal et al, as follows:

Petruska et al, teach (see Scheme 1 and Scheme 2) a biochip wherein the zirconium is bound to the surface of the support by way of a spacer molecule comprising a fatty acid chain, octadecylphosphonic acid (as recited in claims 7 and 8).

Petruska et al, teach (see abstract, introduction, scheme 2) a biochip wherein the spacer molecule (also called a capping molecule) is octadecylphosphonic acid and the metal is zirconium (as recited in claim 10).

Petruska et al, teach (see abstract, and definition of Langmuir monolayer method) a biochip, further comprising a sheet of glass having a surface covered with a monolayer of zirconium octadecylphosphonate (as recited in claim 12).

It would have been prima facie obvious to one of ordinary skill in the art at the time the invention was made to combine the device and method of immobilizing a nucleic acid onto a glass solid support that has been covered with zirconia on a biochip as taught by Agrawal et al, with the Langmuir-Blodgett film method (a Langmuir-Blodgett (LB) film is a set of monolayers, or layers of organic material one molecule thick, deposited on a solid substrate. An LB film can consist of a single layer or many) as taught by Petruska et al.

A person of ordinary skill in the art would have been motivated to combine the device of the biochip and the method of making the biochip which has a nucleic acid immobilized onto a glass solid support which has been covered in a layer of zirconia as taught by Agrawal et al, with the Langmuir-Blodgett method as taught by Petruska et al, because the zirconium/phosphate interaction is strong, and the nature of the stepwise procedure employed allows for the easy construction of alternating layer of LB films which results in a procedure that is an extremely convenient way to prepare alternating layer films (see introduction, Petruska, et al).

Petruska et al, teach the use of a metal, zirconium, bound to a spacer molecule. Formation of the Langmuir-Blodgett monolayer to the support is made up of Octadecylphosphonic acid that serves as the spacer molecule attached to zirconium to aid in binding to the support (see scheme 2),

Furthermore, because of the strength of the metal-head group interactions, zirconium phosphate films are extremely stable LB assemblies (see conclusions, Petruska et al).

Finally a person of ordinary skill in the art would have had a reasonable expectation of success because utilizing the system described by Petruska to more stably immobilize a biopolymer to a solid support is a well-known method in the art. The Langmuir-Blodgett method is well described in the prior art and has robust elements for reliably coordinately bonding a metal to an organic molecule on a solid support.

Agrawal et al, in view of Petruska et al, fail to teach a polyG spacer group between the body of the nucleic acid and the phosphate group.

However Lockhart et al, further remedies the deficiencies of Agrawal et al, and Petruska et al, as follows:

Lockhart et al, teach (see Figures 1B and 1C) a nucleic acid bound to a solid support with a spacer or linker (element 4) attached between the body of one nucleic acid and the attached to the end of another nucleic acid (as recited in claim 4).

It would have been prima facie obvious to one of ordinary skill in the art at the time the invention was made to further combine and modify the device and method of

immobilizing a nucleic acid on a biochip as taught by Agrawal et al, with the Langmuir-Blodgett film method as taught by Petruska et al, with a spacer molecule for attaching a nucleic acid to a glass support (with a metal coating) as taught by Lockhart et al.

A person of ordinary skill in the art would have been motivated to combine and further modify the device of the biochip and the method of making the biochip with the addition of a spacer molecule to further immobilize the nucleic acid to the solid support because (see column 8, lines 58-62; column 10, lines 15-17) addition of the spacer molecule (as taught by Lockhart et al.) permits the oligonucleotides (for example, double-stranded DNA) in the completed member of the library to interact freely with the molecules exposed to the library. Lockhart et al, also the spacer molecule can be used for construction of the libraries in the same manner as photolabile-protected phosphoramidite activated nucleotides (see column 10, lines 15-17). This will enable better binding and detection of signal after hybridization.

Finally a person of ordinary skill in the art would have had a reasonable expectation of success because utilizing the system described by Lockhart et al., when combined with the teachings of Agrawal et al, and Petruska et al, to more stably immobilize a biopolymer to a solid support is a well-known method in the art. The Langmuir-Blodgett method is well described in the prior art and has robust elements for reliably coordinately bonding a metal to an organic molecule on a solid support.

6. Claims **2 and 19** are rejected under 35 U.S.C. 103(a) as being unpatentable over Agrawal et al, (WO 2003/046508 A2) in view of Petruska, et al, (Thin Solid Films, 327-329 (1998) 131-135, Elsevier Science) and Lockhart et al, (US Patent 5,556,752) as applied to claims **1, 4, 7-15** above, and further in view of Gagna et al, US Patent 6,936,461 (Date of Patent 30 August 2005)

Agrawal et al, in view of Petruska et al, and Lockhart et al, fail to teach a nucleic acid phosphorylated in the 5' position and polyG spacer group.

However, the teachings of Gagna et al, remedies the deficiencies of Agrawal et al, in view of Petruska et al, and Lockhart et al, as follows:

For **claims 2 and 19** the biochip according to claim 1, wherein the biopolymer is a nucleic acid phosphorylated in the 5' position; furthermore, the nucleic acid has a polyguanine spacer group between the nucleic acid and the phosphate group

Gagna et al, teach (see column 17, line 66, column 23, line 58) a nucleic acid phosphorylated in the 5' position. Each nucleic acid has a tail (which the examiner contends is a linker or spacer) to help immobilize the nucleic acid to the substrate (see column 25, lines 33-37).

It would have been prima facie obvious to one of ordinary skill in the art at the time the invention was made to combine and modify the teachings of a biochip

containing a nucleic acid immobilized on a solid support and the method of making the biochip as taught by Agrawal et al., and the method of coating a glass solid support with the metal Zirconium covalently attached to a phosphate group as taught by Petruska et al, and Lockhart et al, with a linker attached to the body of a nucleic acid phosphorylated in the 5' position as taught by Gagna et al.

A person of ordinary skill in the art would have been motivated to combine and modify the teachings of Agrawal et al, in view of Petruska et al, and Lockhart et al, to include the use of a linker attached to the body of a nucleic acid phosphorylated in the 5' position as taught by Gagna et al, because the tail or linker immobilizes the nucleic acid more firmly to the substrate (see column 25, lines 33-37). Also, by attaching the nucleic acid to the glass surface allows the investigator the ability to characterize nucleic acid/probe interactions (see column 23, lines 24-26).

Finally a person of ordinary skill in the art would have had a reasonable expectation of success because the methods of using modified nucleic acids attached to a solid support as taught by Gagna et al, is well known in the art for use in this manner.

Conclusion

7. Claims 1-2, 4, 7, 9-16, and 19 are rejected.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Garrison Owens whose telephone number is 571-270-

3060. The examiner can normally be reached on Monday - Thursday, 7:30AM - 5:PM, ALT. Wednesday,.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, J. Douglas Schultz can be reached on 571-272-0763. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

GAO

J. DOUGLAS SCHULTZ, PH.D.
SUPERVISORY PATENT EXAMINER